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ABSTRACT

This study was undertaken to consider answers for the following questions: (1) What meanings do reform-oriented prospective science teachers attach to their beliefs, intentions, and actions as they begin to interact in schools? (2) How do those meanings reflexively re-inform the prospective teachers' beliefs, intentions, and actions in science teaching? and (3) What are the implications for teacher education and science education reform? This study focuses on two preservice teachers as they engaged in two middle-level field experiences and student teaching. It is suggested that science teacher educators should more fully explore prospective teachers' beliefs about teaching and learning, challenge the thinking and events that tend to reproduce the status quo, and look for the common points of departure to help prospective teachers construct an empowered and implementable new vision of themselves and their classrooms. (Contains 66 references.) (ASK)

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Reform and the Prospective Science Teacher: Lessons Learned from Field Experiences

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**Reform and the Prospective Science Teacher:
Lessons Learned from Field Experiences**

After four decades of science education reform efforts, the shift from teacher-centered, transmission models of science teaching to teaching where active, learner-centered involvement results in the building of conceptual understandings, is still considered an important national (AAAS, 1989; Tippins & Koballa, 1991; Yager, 1993) and international goal (Wallace & Louden, 1992). While there are undoubtedly many people involved in bringing about science education reform, those who are presently students in teacher education programs - many of whom will be engaged in teaching for the better part of three decades - are important members of a successful reform vision. The questions of how best to understand the implications of this shift for these prospective science teachers, and of how best to support them in achieving and maintaining such renewed visions of education, are crucial ones.

How is the educational reform paradigm envisioned? Grimmett describes the revitalized schools that would result from this shift as places where

> Teaching is not transmitting information or coercing students to learn; it is not a case of teachers *pontificating* and students *absorbing* all they can. These teachers seek to know their students, to listen to them and to reach out to them with care and understanding. . .to create opportunities and capacities for students to reach beyond. . .to foster an insatiable desire for learning. . .to connect with students' constructions of reality. . .In this way they attempt to make learning memorable to students. (in Wideen & Grimmett, 1995, p. 215, original emphasis)

Current visions of reformed science teaching in particular are exemplified in the National Science Education Standards (National Academy of Sciences, 1996). Included as major organizing ideals are themes of learner-centered teaching, inquiry-based learning, the importance of both individual and social construction of knowledge, the investigation of less content in more depth, and equity and excellence for all. The *Standards* also point out, however, that while "outstanding things happen in science classrooms today. . .they happen because extraordinary teachers do what needs to be done *despite conventional practice*" (p. 12, emphasis added). Even after forty years of attempts to support science education reform, the bulk of science education practice--the "conventional practice"--does not yet seem to successfully embody reform ideals (see also Tippins & Koballa, 1991; Weiss, 1978, 1987, 1994; Yager, 1993).

Many of the reform ideals embraced in the current science education standards have been embedded in past science reform initiatives, yet it has proven to be extremely difficult for teachers to make and sustain these kinds of changes (Cuban, 1992; Kyle, 1992). One reason for this may be that the assumptions underlying the purposes, goals, methods, and roles guiding conventional science education differ from those guiding the newer paradigm (Shymansky & Kyle, 1992). Contemporary science reform efforts have notions of appropriate practice that are built on a current theory of human learning that concerns the construction of conceptual understandings by learners (see Driver, Asoko, Leach, Mortimer, & Scott, 1994). In practice, however, the reform ideals built upon this theory are often forsaken in favor of the traditional values and actions that continue to rule in most school science settings (Tobin, Briscoe, & Holman, 1990; Tobin, Tippins, & Gallard, 1994). The attempt to implement reform efforts within a contradictory theoretical context or educational culture has been considered an important factor in much of the failure of educational reform (Cuban, 1992; Fullan & Stiegelbauer, 1991; Sarason, 1990).

The decisions that teachers make about what and how to teach are dependent upon their beliefs about roles, rules, and possibilities in education, which, in turn, have been constructed via the teachers' interactions within a social context (Clark & Peterson, 1986; MacKinnon & Grunau, 1994; Pajares, 1992; Tobin & Dawson, 1991; Tobin, Briscoe, & Holman, 1990). Reviews of current educational literature are quite clear about the presence of a strong and reciprocal link between teachers' educational beliefs and their teaching actions (Borko & Putnam, 1996; Clark &

Peterson, 1986; Goodman, 1988; Pajares, 1992; Richardson, 1996). Teachers' beliefs act as a set of filters through which teachers make sense of current educational issues and their implications for the classroom context.

Peterson and Knapp (1993) state that the decisions teachers make about implementing reform "are profoundly influenced by the theories and beliefs they currently hold. . .they interpret reform recommendations in light of their existing assumptions and frames" (p. 3). Some studies of the interactions between teachers' educational beliefs and teaching actions in reform contexts have highlighted how teachers may compromise their beliefs in order to survive the conflict between personal professional ideals and the values--either explicit or implicit--supported by the context in which they work (Abell & Roth, 1994; Brickhouse & Bodner, 1992; Fischler, 1996). There is also evidence that the cultural myths that science teachers themselves carry as tacit referents can favor reproduction of the status quo (McRobbie & Tobin, 1995; Tobin, Tippins, & Gallard, 1994). If teachers carry with them prior beliefs that contradict reform ideals, and social messages from the larger educational context continue to reinforce traditional goals and methods, it may be too "taxing and potentially threatening" (Pajares, 1992, p. 323) for them to sustain educational reform efforts.

Zeichner and Gore (1989) contend that prospective teachers are susceptible to socialization in traditional educational values and ideals as they learn to teach while situated within the established, conventional school culture. Prospective teachers, then, are doubly burdened, for they must contend with reform issues while immersed in the process of constructing a teaching self and negotiating their place in the existing educational system. Russell (1993) warns that, as new teachers learn to teach under such conditions, they may develop tensions between their theory and practice beliefs which they cannot resolve--survival considerations may then take precedence over the learning to teach process itself.

Because field experiences are often positioned (either temporily or conceptually) as the bridge between teacher education and "the real world" of the schools, they have been popularly considered a pivotal point between the perspectives that prospective teachers lived as students and the vantage they are constructing as developing teachers (Anderson & Mitchener, 1994; MacIntyre, Byrd, & Foxx, 1996; Weaver & Stanulis, 1996). Zeichner and Gore (1989) summarize the field-based influences that might serve to socialize new teachers into existing contexts, including pressure from students, other teachers, evaluators, or schools as organizations. Lacey (1977) and Tabachnick and Zeichner (1984) are among those who have demonstrated that teachers take on interactive roles in their socialization process, which result in behaviors ranging from capitulation into the norm, to strategic compliance (political adoption of behaviors without intellectual agreement), to resistance. The importance that prospective teachers place on field experience, however, coupled with the power dynamics inherent in them, prodded Britzman (1991) to call field experiences "a vulnerable time" for prospective teachers. She warns that, as prospective teachers "set about to accentuate the identities of their teaching selves in contexts that are already overpopulated with the identities and discursive practices of others" (p. 201), they may be overwhelmed with confusion, disillusionment, and burn-out from the mismatches. It therefore becomes crucial to ask what understandings prospective science teachers are constructing about reform efforts during their field experiences, as well as how they are constructing them.

Despite the research of the last decade, there is still a dearth of studies on the learning to teach process in an age of science education reform (Abell & Roth, 1994). Teacher educators need to understand the experiences and stories of prospective science teachers, especially those who claim a desire to implement reform ideals, if such ideals are to become transformed into living practices that are sustained within classrooms. This study was undertaken in order to begin to consider answers for the following questions: What meanings do reform-oriented prospective science teachers attach to their beliefs, intentions, and actions as they begin to interact in schools? How do those meanings reflexively re-inform the prospective teachers' beliefs, intentions, and actions in science teaching? What are the implications for teacher education and science education reform?

Guiding Frameworks of the Study

Because this study is concerned with the experiences and meaning-making of prospective teachers, a phenomenological theoretical framework guided the study's design. Phenomenological inquiry is the search for the understandings and meanings (the "structure and essence") that the participants themselves hold about an object, person, or situation (Patton,1990). A researcher, though, in attempting to understand the perspectives and worldview of others, can only do so through his/her own guiding frameworks. As Richardson (1996, p. 114) notes:

> It is understood that the person (researcher) who is attempting to understand how another person constructs meaning is actually constructing an interpretation of the other's interpretation.

In order to represent the co-construction faithfully, it is imperative that researchers utilizing this framework build a deep understanding of the heart of what participants experience. I have attempted clarification of the participants' perspectives a) by attempting to collect a rich and thick data set, b) by looking deeply and intensively at the participants' beliefs and actions over an extended period of time, c) by applying rigorous data collection/analysis procedures, d) by explicitly articulating my own developing understandings for the participants and attending to their reactions during data collection and analysis, and e) by building in multiple elements that would help to ensure the trustworthiness of the study (Erlandson, Harris, Skipper, & Allen, 1993; Lincoln & Guba, 1985).

A constructivist epistemology also guides this study. Constructivism holds that learners are not passive, sponge-like beings that simply soak up newly presented information; but instead are active participants in the learning process who filter information through an existing knowledge schema and make decisions about how to handle that information (von Glasersfeld, 1989). The constructivist framework is complimentary to the theoretical orientation of phenomenology. "The constructivist. . .believes that to understand this world of meaning one must interpret it. . .and clarify what and how meanings are embodied in the language and actions of social actors" (Schwandt, 1994, p. 118). People construct meaning individually, but the meanings they construct are influenced by social contact with the people and events in their world. A phenomenological-constructivist stance, then, gives credit to the rich meanings created by individuals and to the understanding that those individuals create those meanings based upon their experiential interactions in a social context.

Research Design

Understanding the case study. A case is a contextual entity, richly able to situate data within the realm of participants' experiential worlds. In making those worlds explicit, not only are the individually-constructed thoughts of the participants available for interpretation, so, too, is the full social millieu of which they are a part. According to Merriam (1988),

> The case offers a means of investigating complex social units consisting of multiple variables of potential importance in understanding the phenomenon. Anchored in real-life situations, the case study is a rich and holistic account of a phenomenon. It offers insight and illuminates meanings that expand its readers' experiences. . . Educational processes, problems, and programs can be examined to bring about understanding that in turn can affect and perhaps even improve practice. (p. 32)

Framing this research as a case study allowed for the degree of intense examination that would facilitate the emergence of worthwhile insight about the nature of the relationships between the prospective science teachers' beliefs about education, their teaching actions, and the field experience context. An interpretive, or analytical, case study approach was taken in order to collect

the rich, thick data which would "illustrate, support, or challenge theoretical assumptions" (Merriam, 1988, p. 28).

What can a case study tell us about an experience that might matter to readers? According to Lincoln and Guba (1985), a reader shares the responsibility for determining the transferability of the case findings to his or her own situation through consideration of fittingness: "the degree of congruence" between the researcher's and the reader's contexts (p. 124). The reader decides whether and how some new context or situation is similar to the one described in the study, as well as the degree to which the assertions drawn from the study might be useful in understanding the new situation. Donmoyer (1990) expands Lincoln and Guba's argument by highlighting how case studies are schema-enriching, and therefore useful even when there is not a great degree of similarity between situations.

> When learners use these cognitive structures to assimilate or accommodate new and different information, the structures themselves are enriched. When generalization is thought of in this way, the diversity. . .becomes an asset rather than a liability. . . the knower is confronted by all sorts of novelty. . .consequently, the knower's cognitive structures become more integrated and differentiated; after novelty is confronted and accommodated, he or she can perceive more richly and, one hopes, act more intelligently. (Donmoyer, 1990, p. 191)

A case, then, becomes both a rich description of a phenomenon and a worthwhile interpretation of that phenomenon, as it broadens a reader's ability to construct new meaning from any given situation by enriching the schema against which new knowledge is considered.

Participant Selection. In studies that attempt to develop intense descriptions and interpretations of a case, it is sometimes necessary to limit the number of participants in order to prevent the dilution that might occur if the time investment necessary for a rich data collection and analysis is compromised by the time needed for those processes. "The validity, meaningfulness, and insights generated from qualitative inquiry have more to do with the information richness of the cases selected and the observational/analytical capabilities of the researcher than with sample size" (Patton, 1990, p. 185). According to Seidman (1991),

> The researcher's task is to present the experience of the people he or she interviews in compelling enough detail and in sufficient depth that those who read the study can connect to that experience, learn how it is constituted, and deepen their understanding of the issues it reflects. (p. 41)

In order to present a rich understanding of the participants' experiences, I strove to be immersed in developing deep understandings of two participants as developing science teachers (which includes understanding them as individuals, as prospective teachers, and as science students), of the context of the differing school environments in which they were placed during multiple field experiences, and of the evolving interactions that became evident between their articulated beliefs and their lived actions.

Because this work was concerned with gaining deep understanding about a particular experience (prospective teachers' reform-oriented beliefs about science teaching and learning as they begin field work in schools), a combination sampling approach encompassing both operational construct sampling (Patton, 1990) and reputational-case selection (LeCompte & Preissle, 1994), was most appropriate. This selection process allowed the researcher to chose those participants who would, because of their strong beliefs in science education reform tenets and their articulate reflective capabilities, be most suited to helping others understand this case .

Description of Participants. Both Iris and Doug (pseudonyms) were prospective science teachers at a large university. Iris was preparing to seek a middle school science position, while Doug was preparing for a high school position. Both were seeking state certification in Earth and Space

Science, General Science, and Environmental Science. Only Iris' story is reported in this paper: she was 20 years old at the beginning of the study.

Iris. Iris was an unusual prospective teacher in some respects. She took a stronger stance on reform-oriented teaching than many other prospective teachers seem to take, which made her an excellent candidate for participation in this research. She also demonstrated a high interest in and motivation level toward becoming a good science teacher, one example of which was her decision to apply for dual certification (both elementary and secondary) in her preparation for eventual middle school teaching (this state does not have a middle level certificate). One consequence of her dual certification was that Iris participated in three semesters of field experience (Summer 1996 for her elementary school middle-level field experience, Fall 1996 for her secondary school middle-level field experience, and Spring 1997 for student teaching). Another interesting event that occurred during the study was that Iris was placed in an Alternative Middle School for the first ten weeks of her student teaching semester, and a more traditional Junior High School for the last 5 weeks. She was therefore able to explore her thoughts about reform-oriented science teaching and compare what she had learned through her experiences in both traditional and reform-oriented contexts.

Though her philosophy, her dual certification program, and the nature of her field experiences set her somewhat apart from most typical science teacher education students at the university, it is these very things that make her an educative example about learning to teach science in an age of reform. If Iris' experiences have given her the support she needs to grow into a reform-oriented teacher in schools, readers can think about the ways to build upon them to enhance the support that other prospective teachers might need. If Iris, already a devotee of reform philosophies, struggles with learning to implement reform in the schools, educators will need to think about how she struggles, and why, and what that means for our expectations of all prospective teachers--especially for those who might be considered "more typical" in terms of their motivation level and their philosophies about science teaching and learning. Additionally, the inherent contrast in Iris' field experiences put her in an even more potentially educative position. If science educators hope that prospective teachers will hold reform-oriented philosophies and implement them well in the schools, what might we learn from someone who can speak about attempting to do so in both traditional and alternative school programs? Because of these factors, the understandings that Iris created of her experiences as she attempted to implement a reform-oriented philosophy can serve as what Patton (1990) names a "critical case."

Methods of Data Collection and Analysis

The methods employed in this investigation were interpretive (Erickson, 1986). During data collection, the participant was engaged in two middle-level field experiences, and then in student teaching. Data from the initial participant screening interviews has been included in the data pool, and the main data collection period for this study spanned an entire calendar year. More data continue to be collected during Iris' first year of teaching.

Data Sources. Primary data consisted of verbatim transcripts from the audiotapes of 14 formal, general interview guide interviews (Patton, 1990) and over 40 informal interviews, the documents and artifacts created during the participant's teacher education program (including Iris' professional porfolio, field experience journals, lesson and unit plans, student teaching notebook, videotaped teaching episodes, etc.), and the researcher's field notes from 16 classroom visits across the field experiences. Secondary, supporting data was gathered from a journal that documented the researcher's thoughts and beginning analytical conceptions during the research process.

Data Analysis. A phenomenological study necessitated the development of theory that was grounded in the data (Strauss & Corbin, 1990). Analysis of these data was inductive and emergent, allowing themes from within the data set to be developed (Bogdan & Biklen, 1992; Merriam, 1988). All sources of data were repeatedly examined to uncover salient patterns: the

examination was begun immediately upon the inception of data collection and continued throughout the study. In this way, a constant comparative method (Glaser & Strauss, 1967) facilitated the collection of continuously more purposeful data as issues arising from the data set were used to shape further data collection. Multiple readings of the data (aided, in the case of the interviews, by listening to the recorded audiotapes) allowed the researcher to generate simple margin codings, and then progressively more mature categories for emerging issues (Erickson, 1986; Strauss & Corbin, 1990). The data were reprinted on paper color-coded by field experience, unitized (Miles & Huberman, 1994), and organized according to developing theory (Strauss & Corbin, 1990). Categories were reordered, redefined, refined, added, or subtracted, as best befits the voice of the participant and the researcher's best understanding of the data. Analytical or summary notes were kept with each group of evidence, and concept mapping was often used to help articulate and re-shape emergent understandings. The data were re-examined for confirming and disconfirming evidence, as well as to attempt alternative explanations (Lincoln & Guba, 1985). Base-level assertions were examined for patterns and relationships across the prevailing themes, so that more sophisticated understandings and assertions could be constructed.

Lessons From Iris

It is important to note that Iris lived multiple stories during her field experiences, as all prospective teachers surely do. Preparing for life in schools is a complex process--one composed of many long and interwoven threads representing the interaction of skills, knowledge, beliefs, dispositions, and context. For Iris, however, one strand of threads stood out from among the others to form the central and defining theme of this year in her life: the politics of the learning to teach experience. That theme serves as the focus of this work--other understandings to be derived from Iris' story are reported elsewhere (McLoughlin, 1998).

In May of 1995, Iris had just completed the first of two science methods courses for prospective secondary teachers (the second course in this sequence would be taken the following Fall), and was currently a student in a science methods course for elementary teachers. At the beginning of data collection, Iris articulated the goals that she held for students. She wanted them to become interested in science, to understand science concepts and processes as well as science facts, to see connections between science and their lives, and to learn to think critically and live responsibly (especially in relationship to the natural environment) as scientifically literate citizens (Iris, Interview, 5/20/96; Professional Portfolio). The instructional strategies that she intended to implement on her path to those achieving goals included hands-on science, open-ended and higher-order classroom discourse, a focus on "real life" problems and events, continuous and varied assessment in the service of instruction, a positive classroom management style, and an emphasis on student autonomy and responsibility.

Almost immediately, Iris recognized that there were tensions between her philosophy and the context of her field experience classroom, and she struggled to define and implement a teaching style that would both "feel right" to her, and yet "satisfy the powers that be" (Interview, 5/14/97). Over her year in field experiences, Iris' teaching style changed from one of engaging students in constant activity to one which featured the more occasional use of activity; from a more student-led classroom where students shared responsibility and control with the teacher to one in which the teacher retained much more control and responsibility (especially over classroom discourse); from an orientation toward teaching for conceptual understanding to one of teaching for more coverage; from planning, teaching, and assessing individual students to treating the class more as a group; and from using constant and varied assessment to a more regularly-scheduled assessment scheme centering on testing, written essays, and research papers.

At the end of her student teaching semester, Iris was shown an instrument created from a table in the National Science Education Standards (National Research Council, 1996, p.52) that highlighted the changes expected in science teaching as a result of science education reform. Paired items from the table had been placed at either end of continuum lines, and Iris was asked to indicate on each line a representation of where she felt she had been when she began her field

experiences (X), where she felt that she was now at the end of her student teaching semester (/), and where she felt that she still wanted to be (O) as a science teacher (see Figure 1).

With the single exception of the last category, Iris marked X's at the extreme right of every continuum, indicating that she had held a very reform-oriented stance toward science education at the beginning of her field experiences. As can be seen from the slash marks, Iris made a definite (and often substantial) shift towards less reform-oriented views in six of the eight reform elements during her field experiences, and even her philosophy about how reform-oriented she now wanted to be (indicated by the circles) was less reform-oriented than where she had been originally. How did Iris come to these changes in philosophy and intention? To what events/rationale does she attribute her movements toward a less reform-oriented stance?

The Juxtaposition of Reform, Risk-Taking, and Survival: The Politics of Learning to Teach

From very early on in her pedagogical interactions in field placements, Iris faced the struggle between her intended educational ideals and her perceptions of her political "place" within the system:

> I was given two students to help with their math problems. I [began to teach] them to do their division problems just as [my coop] was teaching them. I found myself teaching math just as I was taught - STRUCTURED! I wanted to encourage the boys to memorize their times tables. I encouraged them to follow the step by step procedure [even though] I knew how frustrating this method of learning math can be, especially when you are having trouble. (Iris, Reflective Journal, 5/9/96)

Though she had planned to teach for conceptual understanding with the instructional strategies that would support such a goal, Iris "found" herself using the same "frustrating" methods (here, the rote memorization of the times tables) with which she had been taught as a child. These were methods that she had felt had been ineffective for her as a student, and which her recent educational coursework had suggested were problematic for the goal of fostering students' conceptual development. They were, however, the methods that she saw constituting the approved and dominant form of instruction in her field placement classroom, and, therefore, the ones that she felt compelled to use. What was the impact of straddling this dichotomy--a new teacher's desire for reform-oriented practice versus her expectations of having to defer politically to more traditional practice--on Iris' learning to teach process?

In Borko and Putnam's (1996) overview of research on the learning to teach process, the important cognitive factors in a teacher's learning to teach process are examined: a teacher's general pedagogical knowledge and beliefs (including those about classroom management, instructional strategies, learners, learning, and teaching), his or her subject matter knowledge and beliefs, and his or her pedagogical content knowledge and beliefs (including the purposes for teaching that subject matter, understandings of students' understandings about a given topic, knowledge of curricular organization and materials, and knowledge of representation strategies for content ideas). Yet, as central as cognitive elements undoubtedly are in teacher development, they may be overshadowed by the political struggles encountered in the clash of personal and contextual ideologies during reform efforts. The elements that most saliently framed Iris' thoughts and actions as a prospective science teacher during her field experiences were her beliefs about, and her experiences with, the concepts of place and status in the learning to teach process. As Iris' story unfolded, the meanings that she constructed of her experiences in schools were clearly couched in terms of power and educational hierarchies, permissions allowed or denied. The dilemmas spawned by her desires to implement reform-oriented strategies in the schools resulted in Iris' feelings of dissociation from her own growth process, the crumbling of long-held images of self-as-teacher, and the very real threat of professional failure.

Field experiences are often the part of the teacher education program that prospective teachers identify as providing entry into "the real world" of teaching (Britzman, 1991; Hawkey, 1996; Johnston, 1994). The veneration offered this "proving ground" may play a very real role in disempowering a commitment to reform notions when prospective teachers' goals, and the criteria on which they are (formally and informally) evaluated during their field placements, are thought to differ.

The field experience was seen by Iris as an arena of central importance in two respects: first, it was the place where schooling actually happened, and therefore where the experiences of teachers and students were lived and could be learned from; second, it represented the workplace into which Iris was soon to be hired and in which she desired to do well. For all of these reasons, Iris valued "learning from" and "getting along well" with the people in this context (Iris, Interview, 2/23/97). That desire became complicated by the personal ties that Iris held to reform-oriented goals, events, and methods.

Iris had expected that reform-oriented ideals would be modeled and/or supported, at least to some extent, in the classrooms chosen by the university to be the context in which much of her ultimate learning about teaching would occur. As the field experiences began, however, Iris quickly realized that most of these reform-oriented ideals and methods were neither modelled nor valued in the classrooms in which she and her peers were placed. Simultaneously, two more tacit (and deeply embedded) beliefs about the political place of prospective teachers and the learning to teach process began to compete vigorously with her commitment to reform. Iris believed that classroom teachers were to be respected for the expertise they had gained through their years of experience and for their ownership over their classroom domain: tensions arose between her need to respect and value the practices of others, and her need to respect and value her own practice. With no other identified way to resolve the discrepancies between those practices, Iris defaulted to cultural myths for guidance. She began to develop politicized understandings of prospective teachers as beings of powerless status and lowly place, who had little or nothing to contribute to the classroom context. Both of these conceptions severely compromised her learning to teach process during her field experiences.

The Authority Of Experience: Practice Makes Expertise

Iris held a strong belief in an authority of experience (Munby & Russell, 1994): a teacher's practice in classrooms, she felt, created her expertise. This understanding seemed to rest on two intertwined subsets of beliefs: that teachers learn by teaching, and that seeing positive classroom results meant believing in the methods that had resulted in them. As Iris began to encounter a context different from one which would nurture her ideals, these beliefs worked together in ways that forced her to question her own intentions and goals while resenting the restrictions that she perceived were placed on her opportunities to practice her own teaching.

Respecting the Practices of Others

Iris greatly valued the fact that a cooperating teacher was a *working* teacher--someone who had learned from his or her years of experience, and, presumably, been successful in his or her teaching. To Iris, cooperating teachers were to be respected because they knew things that prospective teachers did not know about teaching and life in schools.

Iris believed that the major contributors to a teacher's expertise were the lessons they learned through experience:

> I would much rather this class do their final copy [of the paper] at home tomorrow. My cooperating teacher disagrees and thinks not all the members will be given the opportunity to do their best at home. Experience allows her to make that decision, so she must be right. (Iris, Interview, 1/29/97)

Although Iris agreed that there were limits to this statement, she generally believed that the more authentic classroom teaching experience that one had, the better a teacher one would be. Iris constructed two important meanings from this belief: 1) that teaching experience in and of itself gave experienced teachers much of value to share, and 2) that only actual teaching experience would enable a teacher to gain expertise in teaching and learning. What was it about actual teaching practice that made it such a crucial learning opportunity for this prospective teacher?

Iris' understanding of the key benefit of teaching experience tied back into her strong ethic of care. Iris believed that good teachers taught in ways that were effective for their students:

> My coop was doing a lot of hands-on, a lot of discussion, a lot of questioning that seemed pretty effective, and so did [another teacher] when I observed in his classroom. We *could see* it being effective. (Iris, Interview, 5/14/97)

If teachers had decided upon certain strategies, then, it was because they had experienced that these methods yielded positive results with students. It was this type of evidence that prompted her to consider other instructional strategies that she had previously spoken against--for instance, a strict disciplinary style:

> I know that one of the big topics last semester was with [my coop's] method of classroom management (laughs)--"The Militant Way". It's just been boggling me for--how many months now? Since May. I remember that every time I met with [my supervisor] he'd be like, "This is how you have to be, Iris. Do you see those students? They *know*. There's so much respect in this room." And so, it was kind of hard for me because I didn't like it, but yet, I *could* see that it was working--the students were so *good*! (Iris, Interview, 12/19/96)

The strength of a teacher's practice lay in the ability to reflect upon the *outcomes* that particular behaviors and strategies had with students, and to build one's practice according to methods that fostered those desired outcomes.

For Iris, these two understandings--that teachers learned by teaching and that seeing positive results meant believing in the methods used--connected powerfully with her expectation that the teachers chosen by the university to provide field experiences were valued as good teachers. Although there were occasions on which Iris seemed to simply strategically comply (Lacey, 1977) to her perceptions of others' demands or expectations, her respect for the expertise that other teachers had gained through practice meant that she began to believe that the ways of teaching she observed in schools might be better than the ones that either she or the university had previously imagined for her.

Where Iris had originally been more judgemental and dismissive in talking about those teachers who used instructional methods which did not fit with her own beliefs, she now questioned her own beliefs much more than classroom teachers' actions. She came to feel that classroom teachers had good reasons for teaching the way they did, even if those reasons were not initially apparent to a novice, and even if those ways of teaching were the complete antithesis of what she had originally claimed to want to implement in her own future classroom. Compare Iris' stance on lecture from the beginning of the study,

> I see myself doing very little lecturing because that's something I just don't care for myself. It just brings boredom into it. (Iris, Interview, 5/20/96)

with a statement she made early in her second field experience:

> You know, I was thinking that, if [this coop] is always very structured and didactic, then maybe it's something I should learn. It's not going to kill me to lecture. (Iris, Interview, 9/13/96).

As Iris came to believe more strongly that the instructional decisions of the teachers she observed had been built on their considerations of what, in their experience, had worked for students, it became increasingly easier for her to consider and value those methods.

In consequence, one of Iris' great lessons about the learning to teach process was that cooperating teachers' work could be respected and emulated without much critical examination. Her acceptance of this idea pushed her towards a less reflective view of classrooms and the events that transpired within them, and dimmed her motivation to search for the additional instructional methods that might also fit those situations. Iris' strong belief in an authority of experience came to mean (a) that she began to honor more deeply and less reflectively the ideals and methods of experienced teachers, (b) that most quandaries arising from a discrepancy between her own and an experienced teacher's instructional style would result in a compromise of Iris' beliefs, (c) that she expected that her own opportunities to practice teaching in these classrooms, in and of themselves, would also provide invaluable lessons in developing her own expertise, and (d) that she expected to spend much of her time practicing her own style of teaching in her cooperating classrooms.

Respecting One's Own Practice

The complexity of the work and contexts of teaching may make it seem as if there is a never-ending series of situations for which to be prepared (Hargreaves, 1994). It should be unsurprising, then, if prospective teachers feel that every minute that could be given over to their developing personal practice is needed to help them be as prepared as possible. As Iris believed that experience in teaching was the key to developing classroom expertise, it was even more critical that she have many opportunities to practice her teaching and examine the results than it was that she be told and shown the lessons of others.

The great value of prospective teachers' development and implementation of lessons during their field experiences, Iris felt, was that they could only learn about their craft by practicing it:

> I want to teach as much as I can so that I have the background. I want to have the experience so I can learn. (Iris, Interview, 1/29/97)

Iris was very concerned, for varying reasons but throughout her entire year in the field, that she was being denied both the quantity and quality of the experiences she needed:

> The [elementary field placement] frightened me in the fact that I would be sharing my cooperating teacher with another pre-student teacher. [The other pre-student teacher] and I get along fine. My concern was based in the need for practical teaching experience. I wanted this course to give me the chance to spend as much time teaching and managing a classroom as possible. The opportunity for this teaching time was now cut in half. I was unsure of how the arrangement would work out and this created a very uneasy feeling for me. (Iris, Reflective Journal, 5/9/96)

> [The next five weeks] sounds like a situation where it is just like last semester. My supervisor said, "You are not going to be teaching directly. Your job is going to be to have proper materials out and have [the groups] ready to move on to the next thing when they are ready." So it sounds just like I'm just there [getting them started] again. I am not looking forward to that. I mean, there's just so much *more* to do in a classroom! (Iris, Interview, 4/02/97)

When Iris did not feel that enough time was given over for her direct practice of her own teaching, she felt frustrated. She saw her time in the field as part of a very limited opportunity to prepare for her career, a career that now loomed very closely on the horizon. Without teaching practice, she felt, a prospective teacher "would not get the true experience" of teaching (Iris, Interview, 6/5/96), and not learn the things s/he needed to learn in order to be an effective teacher.

This idea was further supported by Iris' belief that, when she had direct experience with teaching, she was able to improve her lessons depending on the student outcomes she observed:

> Second period always teaches me what I need for third period. Yeah...I think I do better in third period because I learn second period. I think that I do a better job because I polish things up a little bit more. [During second period], I start thinking about where they're going once they've started, and what I should have related somewhere else. I'm much better third period. (Iris, Interview, 11/20/96)

The results that she, herself, had with students made the deepest impression on Iris, and enabled this teacher to make her most meaningful decisions about future, and better, teaching. Consider, for example, her experiences with cooperative learning.

Iris' own middle school had been a cooperative learning research site, and she did not have happy memories of this instructional strategy:

> Oftentimes we were put into groups based on our ability levels and it was almost like you knew who was the smart person, the medium person and the not so smart person. . .A lot of teachers used the activities just to fulfill the requirement, not because they were essential to what we were doing. And we would be doing things that weren't relevant to us. (Iris, Interview, 5/20/97)

This opinion was seemingly reinforced by her experiences in college:

> Even as an undergrad, I continued to be burned by cooperative learning. It seems that there's always one person that gets stuck doing all the work and the other [group members] doing very little. . .or people incorporate it with one person doing all the writing, one person doing this--and it's all separate work so it's, it's all divided and not cooperative. I have not seen successful experiences with it in my own life, and. . .I just haven't seen the benefits. (Iris, Interview, 5/20/96)

Iris also noted that even though people that she respected at the university valued cooperative learning, she just could not bring herself to do so.

When she entered her field experiences, though, Iris found that many teachers favored this instructional strategy. For that reason, she felt compelled to use it in the lessons she taught, and surprisingly, she found that the students had very positive results with it:

> Seeing how the class was--trying cooperative learning out and seeing how it really worked--was *such* a positive experience for me! I'm much more in favor of it now. I know I've talked about hating it so many times and everything, but I think it's one of the most significant changes that came into play for me. I mean, I had never liked it but now I just use it so much in every lesson. I was never really a big fan because I had *hated* this as a child, but, you know, I could really see these kids' growth, so what am I going to do? (Iris, Interview, 6/16/96)

The value of a prospective teacher being able to amass actual teaching time, then, was that it enabled her to gauge strategies and philosophies by actual results--a value which society in general, and the scientific community in particular, value highly. Iris felt that she would grow as a teacher only by having her own opportunities to teach, and by paying attention to the results of that teaching.

To Iris, field experiences were supposed to be a time for prospective teachers to practice the art of teaching, and especially, Iris felt, to "try out" and refine their own educational philosophy. Prospective teachers had worked hard to formulate some guidelines for their teaching--it was now time to test those hypotheses. It was especially crucial for Iris, who had ideas about teaching that were sometimes very different from the ones which often dominate in schools, that this time be devoted to experiment with practicing the things that *she* wanted to practice, and that she feel

enabled to implement them in the ways which mattered to her. In her field experiences, though, she felt that she was not given the opportunities that would have been most meaningful to her, but instead found herself constrained in what she could do, and when:

> For the seven weeks [that we were observing], I came in and cleaned the refrigerator, I organized the minerals, I cleaned out whatever, I cut cartons - I did all those non-instructional things. I wasn't even in [my coop's] classroom! Whenever I got there, I got my list of "You need to do this, this, and this before you leave," so I would go do this, this, and this, and then leave. And then when it was time for my teaching to begin, I said, "Okay, when can I teach? I have to teach two lessons." And so [my coop] said, "Okay, on Monday can you just do a short introduction to this?" And every time I asked it was just that same thing, "We need an introduction to this lesson," or "I need you to help work with the small groups." (Iris, Interview, 12/19/96)

> Everytime I'm going to do anything in his room I have to watch him do it first the period before. And I feel like he's telling me *exactly* how to teach it, you know? It's bad enough that I don't get to write any real lessons--all we do comes from that little lab book and he doesn't even like to change any details to make the activities better! (Iris, Interview, 12/5/96)

> When I first came into it, [the coop] said, "You don't have to do any planning or anything, [the curriculum] is all set up. This is how I want you to do it." But the whole time I was there, I wanted to do more. . .spend more time on this concept or interact more with the students--do *something* my way. But I didn't have the freedom to do that. (Iris, Interview, 5/14/97)

Without the chance to try out her methods of doing things, Iris had no way to test out and refine her preferred instructional strategies:

> I: I mean, it really hurts you when you can't practice what you want to practice. I just feel like I didn't have ownership of anything, you know?
> A: Does that mean you can't feel good about what you did?
> I: It changes things. I'd like to try a lot of it the way *I* want to do it. Otherwise, it doesn't really help me. (Iris, Interview, 12/19/96)

Iris began to fear that she would neither develop the skills to effectively implement her philosophy, nor be able to evaluate and refine her instructional strategies based on their results with students, and this problem became the central and defining feature of her learning to teach process in the schools. If field experiences were truly designed to help her grow as a teacher, then she should have had plenty of teaching time and the ability to try the things that mattered to her, and she should be assisted in learning how to do them well. Instead, what Iris came to understand was that her field experiences were not designed to serve her. For most of her time in the schools, Iris felt that she was an outsider who was being allowed to visit her future workplace in order to learn the skills that teachers used within the existing school context.

The Workplace Guest

Iris had a very definitive understanding of the acceptable dimensions of her behavior in a classroom. A guiding metaphor that emerged very strongly for Iris during the study was her perception of herself as a "guest" in her cooperating teachers' workplace.

Bound By The Desires Of The Host

Iris' understanding of a workplace guest is one who is not invited by the hosts for enjoyment purposes, but is thrust upon them in varying intensities of professional obligation. A workplace guest very explicitly visits in order to observe and learn from the host in a type of apprentice-master relationship. The host-master is the holder of expertise and wisdom, and the guest-apprentice is there to observe the master's demonstrations of techniques, and later employ them. The host does not have to feel at all disposed to understanding or meeting the guest's needs or wants. Indeed, even if that does happen, a workplace guest may feel as if s/he has imposed upon the host, who is acknowledged to be a busy worker involved in a busy context.

> Well, what first happened was that we had to conduct our concept discussion and our math interview during the first week or second week in schools. So we asked our coop when we could do that and she said, "Do it on the day I'm not there. That will be great. On Friday, just do them both." And so we just went, "Okay" and wrote it down. Then we went to class and we told our instructor and she said, "You're not going to be ready. We haven't covered that." And I was like, "Well what are we supposed to do? We're inconveniencing this teacher enough!" (Iris, Interview, 5/20/96)

In order to be a polite guest, Iris felt that she had to minimize her intrusion as a guest as much as possible.

When tensions arose, Iris felt that she had no choice but to let her desires take a back seat to the wishes of the teachers who hosted her. Even when Iris was unhappy about feeling pressured to bow to other teachers' schedules, abide by their rules, incorporate their routines, or mimic their teaching style, she did not feel that it was her place to voice that disagreement to the cooperating teacher:

> So we went through the problems in the book as I held the teacher's manual. We did five problems together as a group and then I had to give each student their own problem to do on the board. . .I had to follow the procedures of the lessons taught by my cooperating teacher and every day she usually has the students do the problems on the board, then they go over it, they make an assignment, and that's how it is. That's how she wanted me to teach and that's how I taught. (Iris, Interview, 5/20/96)

> Today was like my coop handing me her towel and saying, "This is how to do it--go to it!" I do not disagree with [my coop]. She is pretty organized in how her classroom runs. She doesn't like changes that alter the day's procedures. This is her classroom and I am merely a guest. I teach some lessons and I get some experience, but I am a guest in her classroom and I would never go against her. (Iris, Interview, 5/16/96)

> When I first came into it, [the coop] said, "You don't have to do any planning or anything, [the curriculum] is all set up. This is how I want you to do it". . .I just said, "All right." (Iris, Interview, 5/14/97)

Similarly to the student teachers in the Munby and Russell study (1994), Iris felt that she could "hope for the best but. . .[could] not or should not be expected to take responsibility for making it happen" (p. 90). As she noted sadly one day,

> I would rather do something different but I'm happy with what I have, you know what I mean? I think things could be a lot worse. (Iris, Interview, 10/10/96)

Iris was also uncomfortable with the idea that her university supervisor might take up such a role:

> My supervisor was pushing another coop to let his student do other things, and I could just foresee her doing that to my cooperating teacher. I don't want her to tell my coop that! I don't want to step on his toes! (Iris, Interview, 11/20/96)

To voice disagreement or argue for compromise with her cooperating teacher, even through another person, might jeopardize her chance for continued collegial relations with her host. Such collegial relations, Iris felt, were necessary to her survival on the paths to graduation, certification, and job-hunting. Relationships with significant people in the schools were, at this point, more important to Iris that relationships with university personnel. In the schools, Iris felt keenly that she was an outsider in a domain belonging to others, and that her presence would be welcomed or suffered only as long as she did the right things--that is, those prescribed or valued by the host.

The Impotence Of Low Status

Iris, who felt that her learning depended so critically on her ability to practice the implementation of the philosophy in which she believed, thus viewed herself as powerless within the context or situations to which she had been assigned in her field experiences. Throughout the year, her interview transcripts were rich with the language of impotence.

Mantras Of Place. Iris' voicing of the ways in which her place as a workplace guest and her low status as a prospective teacher forced her into acceptance of these situations, rather than ordaining her with the empowerment to change them, echoed hauntingly across the data.

> Well, I couldn't do anything different because my coop said, "I need you to give this spelling test. This is what you're going to do." And so it's, it's always like that, you know? (Iris, Interview, 6/04/96)

> We were in a team meeting and one teacher was talking about doing a medieval theme, and I just thought, "Wow--what could a science teacher do with that?" I mentioned building materials because we're getting into rocks and minerals and that teacher said, "Oh, that would work!" But then I noticed that my cooperating teacher didn't respond, so I was like, "Maybe I'll just go get a drink of water. . ." (Iris, Interview, 9/13/96)

> There were a lot of problems with classroom management [when I observed], but you know, being a pre-student teacher and coming into a classroom in the middle of a year, there was just nothing I could do. (Iris, Interview, 12/19/96)

Certain catchphrases in particular, especially "no making waves," "someone else's classroom," and "do as the Romans do," surfaced again and again as Iris discussed her experiences:

> I talked just briefly about how religion plays a role in Japanese gardens but because I am a pre-student teacher I wasn't going to create any more waves than I needed to by mentioning religion, so it was just mentioned briefly about how the gardens changed because of the introduction of Buddhism. (Iris, Interview, 5/20/96)

> Constantly we're told, "When in Rome, do as the Romans do." I would never even think of saying a word to my coop, you know? I'm in very good standing with her right now. (Iris, Interview, 5/30/96)

> I got to observe another teacher last week. I'm walking around the room and the boys in the back of the room are wrestling and I can see them from the other side of the room. The teacher obviously had to be aware of it and in my head I'm like, "Someone's going to get hurt. What do I do? This isn't my classroom!" I went up to the teacher and I said, "Um, excuse me. The boys in the back of the room are wrestling. How do you normally handle that?" Because *I'm* not going to just handle it. I don't know her discipline strategy, you know, and I'm a *guest* in this classroom. So she turns and she yells at them to get back to work which silences them at first, but then they all go right back to wrestling. (Iris, Interview, 10/23/96)

> I don't know - maybe I should have been more of an authority, but I just didn't want to step on toes. (Iris, Interview, 11/02/96)

> Like in Smith's classroom, when I went to do the activity where [the students] make brochures about the planets, I needed a place for them to get information. I knew it was in the textbook and I said to them, "Can you all bring your textbooks tomorrow?" And they all went "No. We were told we would never have to bring them. We are not bringing them." And so I could see Smith was upset. He didn't want them to bring the book and he didn't want me to give notes, and I just have to do *whatever* in someone else's classroom, you know? (Iris, Interview, 5/14/97)

There was such constancy in Iris' invocation of these phrases that they brought to mind the Eastern concept of mantras--repeated refrains of acceptance and protection. They seemed to be used to explain away (both for herself as well as for others) her decisions to set aside her personal beliefs and intentions in order to act in accordance with the desires of others. They certainly reflected Iris' understanding that she, as a prospective teacher, had little to no power to wield in determining or contributing to her own growth in the learning to teach process.

Iris' understanding of her low status also meant that, aside from not feeling able to request the teaching time she craved, she certainly did not feel able to implement the reform-oriented strategies that would have looked so different from the teaching methods that her cooperating teachers employed:

> They *like* their teaching. I can't go into someone else's classroom and teach however I want. I'm new to this. Being a guest in someone else's classroom, I have to do what *they* would want me to do. (Iris, Interview, 9/13/96).

Unless she was explicitly invited to share other methods of teaching, Iris was afraid that doing so might intimate to her cooperating teachers that there was fault with their methods, and imply that this prospective teacher, this *apprentice*, knew better than her hosts.

Iris was therefore left with little room to test out the reform-oriented tenets of her educational philosophy:

> I think that I was losing faith in the alternative methods because I was just not seeing them in the classroom, or I'd see them but there was no management and it was just chaos. I had no way to try them and when I saw them, they just didn't work. (Iris, Interview, 5/14/97)

With limited modeling of reform ideals from her cooperating teachers, no way to test them out those types of instructional strategies herself, and little evidence of positive student results to back them up, the more traditional strategies favored by Iris' hosts gained prominence in her mind.

Examples were near at hand and seemed to produce the results valued by those in evaluative positions. It became easy, Iris later noted, for reform-oriented intentions to get "lost in the shuffle" (Iris, Interview, 5/14/97).

The reinforcement of low status. Was there evidence that the low status of prospective teachers that Iris perceived was reinforced by other significant players or events in the field? In this excerpt, Iris recalls when another prospective teacher shared his discomfort with the university supervisor for attempting to negotiate classroom events with his cooperating teacher:

> I have my evaluation tomorrow with [my supervisor] and [my coop]. And [another pre-student teacher] just told me that in *his* meeting, [our supervisor] firmly said to his coop, we would like to see [this pre-student teacher] planning and implementing his own 45 minute lesson. And his teacher wasn't too excited about that and [the pre-student teacher] wasn't happy with it because he doesn't want to step on his cooperating teacher's toes. (Iris, Interview, 11/20/96)

On a few other occasions, Iris noted that this recognition of their low status was shared by her peers. Their concept of being a "guest in someone else's classroom" may even have originated with the university. Prior to participating in any field experiences, Iris and her fellow prospective teachers read and signed the university's standard "Guest-Host Form", which laid out the expected code of behavior for the duration of their field experiences in the local schools. The form was short and general, but may have sowed or fertilized the seeds of status recognition for Iris and her peers.

In Iris' view, messages about her low status could be recognized everywhere. One unexpected source was embedded in the school students' resistance to any attempted change of normal class routine:

> I mean, what am I going to do? The students are so self-directed in their learning, you know? They know the rules of the class. What the teacher wants, goes--my ideas are not important to them. (Iris, Interview, 5/30/96)

> I: I already had the energy [posters] up and the next class came in and said, "Why do you have your energy stuff up? You're not allowed to start that yet."
> A: A teacher said that, or the kids?
> I: The kids! (Iris, Interview, 4/6/97)

The students in her classes were concerned that their regular routines be preserved, which negated Iris' hope to be seen as a teacher of equal standing with her host. Just as important to Iris as the students' voices, though, were the opinions of those in higher levels of the educational hierarchy.

Some of Iris' cooperating teachers reinforced the theory-practice dichotomy or the necessity of hypocracy for political survival:

> I: We initially told [my coop] that we had to do an interview for science and math, and she said, "Okay, can you do that next week while I'm out? I know that you have projects due because I know [this field experience], so we'll get them over and done with and then we can get on with what really matters."
> A: Did she actually say that--"what really matters"?
> I: Yeah. So that's good [sarcastically]. Like, for science we've had other problems to do and my coop has said, "Just do what that man wants you to do for science, and then we can teach the real stuff." (Iris, Interview, 5/30/96)

During her second field experience, both Iris and her supervisor had been concerned that Iris was not getting enough of her own teaching time. Iris' cooperating teacher, however, had different ideas about what prospective teachers should have been doing in their classrooms than they did.

> My coop and Mr. Brown--the teacher down the hall--talked about the situation with me and they both said, "Well, you're really only here to get the flavor of a classroom. You're supposed to learn how things work in a school - how we do grades and those types of things. You're not here to take over the class. That's ridiculous." (Iris, Interview, 11/25/96)

This cooperating teacher was firm that it was his classroom and that Iris should do what he thought she should do, even if it meant going against her university supervisor. Iris decided to sacrifice her already strained relationship with that supervisor, in favor of continued harmony with her cooperating teacher:

> My supervisor was pressuring me to teach more this week. I told her that, if I could, I'd do another introduction. She said, "I can't believe you aren't taking an active role in this!" But, you know - I can't be held responsible for something *my coop* tells me to do! Whenever I ask to teach, he always says, "Sure. Do a short introduction to this lesson." Or, "I need you to walk around and see how the groups are doing. That's a lesson--just write that up." (Iris, Interview, 11/25/96)

Iris nearly failed this field experience because she felt that it was more important for her to follow her classroom host's rules than to abide by her supervisor's desires. This sentiment was in line with her belief in an authority of practice--a conception that Iris felt was upheld by the discourse and actions of many others in the schools--and with her hopes to be seen by those in the schools as a good teacher, so that it would increase her chances of finding a job in the area.

Even one of Iris' university supervisors devalued Iris' potential contributions to her own learning process with his penchant for continually reinforcing the omniscience of the cooperating teacher:

> My supervisor came in. . .He just loves my cooperating teacher. He's always like, "Wow! Look how self-directed the students are because of your cooperating teacher." (Iris, Interview, 5/30/96)

> I remember that every time I met with my supervisor, he'd say, "This is how you have to be, Iris. *Learn* from this teacher. Listen to *everything* she tells you." (Iris, Interview, 12/19/96)

This supervisor's stance bolstered an uncritical admiration of teacher as expert, which did not help Iris to look more deeply at existing classrooms, let alone help her to consider the implementation of her reform-oriented ideals.

> It's really upsetting to not be able to practice what you want to practice, you know? Or to really talk with people about what they are doing and why. You're doing what you're told to do but it's not helping you learn! (Iris, Interview, 12/19/96)

Iris had a similar complaint about her student teaching supervisor, whose sparse feedback to Iris consisted mostly of an examination of the extent to which Iris' lesson plan objectives encompassed both lower-order and higher order thinking skills.

It seemed clear to Iris that there were messages from significant others and the general school climate that supported the ideas that prospective teachers (a) were there to learn from experts, and (b) carried the lowest status in the educational hierarchy. As has been noted in the literature, though, the prospective teachers themselves are far from passive in this political millieu

(Lacey, 1977; Tabachnick and Zeichner, 1984). There was evidence that Iris, herself, contributed to the decisions that disempowered her.

Internalization and Projection. Iris did not always wait for those voices that she took to be manifestations of authority to be explicitly suppressive. She had personally delineated many of the the private lines that she would not cross as a prospective teacher.

> A: Which elements of your philosophy did you feel were not supported enough to bring into this classroom?
> I: My own assessments. . .more authentic assessment. Doing something other than just the quizzes from the study guides.
> A: What were the factors that kept you from bringing those in?
> I: I just didn't feel comfortable. I don't know. I didn't feel that they were welcomed. It was always just, you know, what's my cooperating teacher going to accept? (Iris, Interview, 12/19/96)

> I was looking at the [next unit] and I was thinking, "Gosh, I'd love to revise that one!" But I can't even ask. . .it's [my next coop's] baby--she wrote it. Can you imagine my asking to revise it? (Iris, Interview, 12/19/96)

> A: Would you feel comfortable bringing an idea up, at an instructional team meeting, or...
> I: Uh-uh (shakes head negatively). I feel bad because if my coop doesn't want to bring it up, who am I to bring it up? I would feel I was stepping on her toes then. New ideas aren't welcomed by the team. And I can see me bringing up this idea and they will all just be laughing in my face. I am just trying to learn some things, you know. If I were to bring up [new] things, they'd be like, "What are you *doing?*" (Iris, Interview, 2/23/97)

In the meantime, Iris felt, she would watch the classroom carefully, so that she could learn how to do the things that the teacher wanted her to learn. Most of the time, she seemed unaware of her own part in her marginalization:

> I feel like it's time for me to sit down and shut-up and do what I'm told, and do the best that I can to build a relationship [with my coop] and take from the experience what I can. (Iris, Interview, 12/19/96)

Given her strong beliefs in the authority of experience and the workplace guest metaphor, Iris often perceived that her hosts' rules and expectations were imposed upon her, however implicitly, by people and forces beyond her control.

At other times, Iris seemed aware of the fact that she made some contribution to the situation. She remained firm, however, that even if disappointing, the passive route was the best one for her to take:

> A: Did your coop say why she wanted to be so structured about the assessments that she uses?
> I: No, and sometimes I just don't ask. I don't want to offend. (Iris, Interview, 5/30/96)

> It doesn't look like I'm going to have a whole lesson to myself. I'm very distraught over it, but I really don't want to step on anyone's toes, so I'm going to go with the flow. I said to [my coop], "Just give me whatever you want me to do." (Iris, Interview, 11/05/96)

Yet, even with all of these instances of acceptance of her low status and marginalization, there were some occasions when Iris was able to capture a little power for herself in either her classroom decision-making or her teaching actions.

The Development of More Personalized Practice in Politicized Space

There were times when Iris felt able to do more than simply acquiesce to what she thought was most expected of her as a workplace guest. Rare though these events were, it was important to examine Iris' understandings of them, since they represented her ability to go against the norm, against significant others' expectations for her, and against her own acceptance of a powerless status. On these occasions, Iris would either negotiate an event or make an "executive decision" about some teaching action.

Iris negotiated her participation in certain events with her cooperating teachers. She might have been trying to decide upon a topic for her teaching:

> I'm going to teach about tornadoes. It wasn't in the curriculum exactly, but since the theme was air and aviation, I talked with my coop and she thought it fit. It wasn't in the standards for the curriculum, but my coop said that didn't matter as much as staying on the theme. (Iris, Interview, 6/16/96)

or attempting to incorporate an activity into the cooperating teacher's lesson or unit:

> A: In what ways did you add to or change the activities that the class was doing this semester at all?
> I: Gosh, the only activity I even brought in was the mass wasting activity with the paint pans. I found that in a book and then I talked to my coop about it. He re-designed it a different way and then it ended up not even being my own activity, but at least I had found it. My coop had a different method of doing it and his method was much better than the one in the book I found, but so that was the only one I introduced to him. (Iris, Interview, 12/19/96)
>
> I: We're going to start an environmental unit next week.
> A: Now this is the same module that you thought would be all activities from the pre-written microbial curriculum?
> I: Yes, but I've talked with my coop and now I'm going to add my worm bin lessons and stuff--we'll actually be doing a lot with them. (Iris, Interview, 2/3/97)

Negotiating was not a common strategy, however. Iris more commonly felt that she simply had to do what she was told to do. Good guests don't ask too many questions, and neither do good apprentices. It was felt to be too presumptuous, possibly offensive, and unflatteringly revealing to do so, any or all of which would jeopardize what little standing and respect Iris already had in these teachers' classrooms.

Iris also made what could be termed "executive decisions." Even though she later acknowledged her understanding that she knew she had been going against what she perceived to be the expectations of her hosts, Iris would occasionally make a change in her lessons that had not been approved in advance:

> A: Your coop asked you to give short introductions to his lessons, right, and you started doing these, um, mini-lectures about 10 minutes long. But the next time I saw you do one of these introductions, you had a lot of questions for the

students, and the next time, you really facilitated a discussion with them rather than giving a straight lecture, and it seems like that's what you did for the last couple of weeks. Tell me about that.

I: Well, I think I started off with lecture because I felt that's what he was asking for, but then I started adding questions, and then--I just kept seeing how much I could do each and every time. Actually, I don't think it was a slow progression. I think that it happened right away when I saw that he let me do this and also when . . .I saw that the questioning was working better [for the students]. So I just kind of went with what I was able to do and I tried a little bit more and a little bit more and it just became all discussion. (Iris, Interview, 12/19/96)

A: You said this activity was "yours". So you just found this activity and your coop was receptive to you doing it with the students?

I: Well, he just never called me back, you know? I had called him about it but he never called back, so I just had it all set up the next morning and I said, "Ok, this is what I set up." And he just looked and said, "Oh, all right." But I knew I was walking the line there. (Iris, Interview, 12/19/96)

We were supposed to do something where we needed cyberspace, but we didn't have the Internet available. So I asked my coop what we should do and she said we'd find something in the [curriculum] packet. So I looked in it, but what they had was puzzles, and I didn't want those to be our *lessons*. But we are supposed to stick to the team curriculum. So I just made those things homework, and then started the next topic for the lessons. (Iris, Interview, 4/6/97)

Iris had overstepped her bounds and status with these events, but had not experienced horrible consequences for having done so. They seemed to be freeing events, in the sense that Iris felt better for having tried some things the way she wanted to do them, that is, in ways in which she thought they would better benefit the students. Yet, Iris did not take advantage of these successes by trying these techniques more often. They remained rare events throughout her field experiences. Why was she not able to build upon these experiences and explore ways to become more of a part of her own teacher education process? In order to explore these questions, a deeper understanding of these events is necessary. On the occasions when Iris was able to break away from her perceptions of others' demands for her and be a part of her own experience, she recognized a higher level of status for herself. What events or processes empowered her to do so?

At the end of her field experiences, Iris talked about those times when she felt she had been "allowed to make changes" (Iris, Interview, 5/14/97). This language reflects that, although she had been able to inject herself a little more into her teacher education, she still felt that others held the ultimate decision-making power over her. How then, did she make sense of her ability to become at least a small part of things on these occasions?

Whether negotiating or executive decision-making, Iris acted upon ideas that she judged as neither "too extreme" nor "too radical" for her cooperating teachers--she would not stray far from a cooperating teacher's usual routine, philosophy, or style. She looked for ideas that generally fit the cooperating teacher's usual logistical parameters as far as time management, materials management, and student management. The ideas were usually small in scope, able to be implemented in incremental (and therefore less noticeable?) ways, and they added a dimension to what a cooperating teacher had planned without requiring a major shift in planning. That they did not add to the cooperating teacher's workload was also important--Iris felt she would need to personally take on any added work or preparation they entailed:

A: I want you to think about the parts of your philosophy that you were able to implement, and I'd like to know why you felt able to implement them. W*hy* did you feel that you were able to bring certain things in?

I: Well, you know, as long as I fit within the 10 minute introduction time or stuck to the right topic, I kind of had freedom on how I wanted to get there. And that's how I wanted to go, so. . .

A: Okay. So it was because you met your coops' curriculum goals and logistical constraints? Anything else?

I: Well, I was helping the students learn, you know? That's important. And I wasn't doing anything extreme and I could ease into it. It wasn't something that would cause my coops extra work. If there was any extra prep at all, I made sure I handled it. (Iris, Interview, 12/19/96)

Iris acted on events that she felt strongly about in terms of serving her students' best interests, yet from the previous examples in this paper we see that this is a necessary but not sufficient condition for Iris. There were many cases in which she felt strongly about students' welfare--either physically (as in the "classroom wrestling" excerpt), cognitively (as in the "students don't gain deep understanding when I lecture" excerpt), or affectively (excerpts reported in the larger study on which this paper is based)--but in all of those cases, Iris still felt compelled to "take a back seat" or to "shut up and do what I'm told" (Iris, Interview, 12/19/96). She apparently needed a critical mass of some combination of safety factors that lowered her risk (nothing too radical, incremental change, etc.), and possibly a level of frustration about her perceived lack of opportunities to teach, that tipped the balance towards action.

Occasions when enough of these elements coalesced did not occur often. For the most part, Iris continued to feel oppressed by the situations she encountered--she thought of herself as a prospective science teacher who had not been offered nearly enough opportunity to learn to teach during her visits to "someone else's classroom." Her hopes for her field experiences to be a capstone for her personal and professional growth were subsumed by her increasing view of them as a risky and threatening set of political hurdles.

What Did Iris Learn About Reform-Oriented Teaching During Field Experiences?

Through the interplay of Iris' beliefs about the learning to teach process, most notably her beliefs in an authority of experience and in the metaphor of the prospective teacher as a workplace guest, she constructed a reality wherein prospective teachers knew least what was meaningful for classrooms, and should therefore be ready to adopt what others knew best. She learned that attempts at reforming science teaching necessitated intense risk as well as intense physical and emotional effort: a risk from which needed to protect herself, and an effort that went largely unrewarded. She began to "do what she needed to do" (Iris, Interview, 5/14/97) in order to cope with the political and technical demands that consumed her experiences. Kincheloe (1993, p.204) predicts this response, warning that the procedural thinking dominating much of teacher education makes learning to teach a process that is "so passive, so unchallenging, so boring that teachers often lose their sense of wonder and excitement about learning to teach. . .their knowledge is not viewed as intrinsically of worth, but just as a means to the end of certification."

During her field experiences, Iris had not felt that she was being asked to investigate and resolve the discrepancies between her ideas about science teaching and learning and the aims and means often seen in the schools; nor did she feel, for the most part, that there was a supportive atmosphere for her to do so. At the same time, powerful factors persuaded Iris that she should simply accept much of the wisdom being passed down to her by those more knowledgeable: her belief in the authority of experience, her internalization of low status and fatalistic feelings of professional impotence, and the status-quo reinforcing messages that she perceived (explicit or implicit) from both the university and the schools. When conventional wisdom remained too problematic for easy acceptance, these same beliefs and events then prompted Iris to "do what everybody wants me to do" (Interview, 4/6/97). In order to stave off any threat to her graduation, certification, and career, she defaulted to a number of survival tactics. Depending on the context and severity of the problem, Iris either employed the failsafe of strategic compliance, practiced

avoidance of potential conflict situations, or instigated damage control measures such as seeking political allies.

Toward the end of her field experiences, Iris was able to acknowledge the potency of these lessons:

> Having these experiences in the different classrooms has really changed things for me. It's grounded me a lot more and shown me how I can or can't implement things. When I first started I was such a theorist--I just had this idealistic view of the school systems and how I could better them on my own as a single teacher. . .Now, I've seen too many constraints that everyday teachers face. I've seen that there are times when you need to revert back to traditional ways of doing things. Some people that I would have counted as "bad teachers" in the past were now my peers. I guess, just being out there and seeing why they worked that way, and realizing that they came into education with the same kinds of ideas I did and yet they've been teaching this way for 20 years, now. . .I find I need to experiment with their strategies. I just can't go in with my philosophy and think it'll be good. . . I wasn't aware of how many constraints there would be, and it wasn't even my classroom. I've realized now that there are going to be constraints for the rest of my life. (Iris, Interview, 5/14/97)

The overall consequence for Iris, was that she had not felt valued as a thoughtful professional with valid contributions to make to her own growth. The deeper reflective understandings that she had initially sought about science education in classrooms became relegated to a surface skim of issues, if she had the time and energy to move beyond the technical aspects at all. By the middle of her second of the three field experiences, she was frustratedly accepting the understanding that she would not get many opportunities to try out her philosophy in the classroom, much less that she would be respected for holding that philosophy. As her time in the field continued, she completed assignments with less real effort and thoughtfulness, cared less about them, and became disconnected from the learning to teach process in all but the most superficial ways.

> I asked Iris if she felt there was a difference in the journaling she's doing now for her class compared to her first field experience. She said that she just didn't have the energy or time to do more with the journals right now--that she had to be careful of what she said and how she said it. (Researcher's Journal, 2/19/97)

The only real exception to this disconnection evolved during her student teaching semester. This cooperating teacher did treat Iris as a thoughtful professional, developing a relationship with her that was characterized by collegial inquiry and trust. Even the sanctuary offered by this relationship, though, could not help Iris to fully overcome her political wariness of other involved parties or the larger context of the field experience.

Iris noted the extent to which her philosophy of reform-oriented teaching was challenged by her growing convictions that reform was not generally supported in the schools, and that teaching was not necessarily better simply because it had been patterned on reform ideals:

> When I compare the reform program I've visited with the more traditional schools, I'd say there's problems with both, but there's advantages of both. It really depends on who's teaching as to which program is better. I observed two traditional classrooms yesterday that were excellent, far better than some of the classrooms of members of our team. I thought, "If it was a choice of getting my children on this team, I'd put them in the traditional program instead," because it really depends on the approach that the teacher takes. . . (Iris, Interview, 1/25/97)

> Other things made me think, too, like my paper contrasting the three middle schools. Not one of them really followed the middle school concept, and why is

> that? Is it because they thought it wouldn't work? Is it because they tried it and it failed? Why does reform not go as research says? The research just seems like a utopia sometimes. There really are constraints in middle schools and veteran teachers don't want to change. And, you know, they have some good points, so that's one of the biggest battles for reform. I think you need to take the best of both worlds. Create a balance. No more cycles of one thing being best, then another. (Iris, Interview, 5/14/97)

The danger here is not that Iris began to think more broadly about, or even to question the efficacy of, reform-oriented teaching, but that she became somewhat socialized into these conceptions because of a lack of opportunity to try things out more fully, and by the politics and situations that threatened her. MacKinnon and Grunau (1994, p. 173) explore how student teachers conceptualize teaching "in terms of the generalized other," attributing identity development to "idealized images that are formed and reified through participation in the social fabric of particular groups." The reactions of significant others, then, contribute greatly to the creation of self-image. Iris' confidence was undermined and her sense of self was threatened as she now felt pressured by the desires of others to reconstruct the professional image she had been building for years in their absence.

Clandinin and Connelly (1988), Calderhead and Robson (1991), and Johnston (1992) are among the researchers who have examined the role of professional images in the learning to teach process. Such images are borne of teachers' personal life histories, and have strong emotional and moral ties. Because of this, while practice teaching offers prospective teachers "the opportunity for refining and clarifying their images of teaching," it also offers the potential for severe conflict (Johnston, 1992, p. 131). Hawkey (1996) believes that new or prospective teachers who hold strong images of self-as-teacher are in danger of having that image compromised, or even shattered, by the cultural norms of the schools.

In this way, the perceived political orientation of the field experiences precipitated an identity crisis for Iris. Just prior to beginning her field experiences, Iris held a strong image of the teacher she desired to be, yet that image came into some degree of conflict in all of the classroom environments in which she had been placed, and into relatively severe conflict in two of those classrooms. While Iris' attachment to her original image had been strong, the image itself had been superficial in some respects. The details--the things Iris would need to do or say in order to be confident as that teacher--were indistinct or missing. According to Hawkey (1996) and Britzman (1991), this leaves prospective teachers susceptible to an uncritical conformation to school culture and to an arrested development as thoughtful professionals.

Coupled with Iris' feelings of powerlessness and low status, these issues led to the unraveling of the learning to teach process for her as a reform-oriented prospective science teacher. Grimmett and Neufeld (1994) characterize this process as the "struggle for authenticity. . .teachers attempt to discover both their true selves as responsible professionals and the new knowledge that enables them to see possibilities in teaching that will lead to a redefinition of classroom realities and roles and an enhancement of student learning" (p. 4). Implementing the methods in which her personal self believed meant that Iris had to accept the very real political risk of professional failure, while implementing survival tactics and more traditional behaviors as an acquiescence to political threat meant that she compromised--indeed betrayed--her more personal self. Iris' own awareness that she had not reached a point of comfortable redefinition wreaked further havok on her self-confidence. While other newly hired teachers would be prepared with the new visions, knowledge, and skills that they had honed during their field experiences, Iris felt that she would "still need to try everything out for the first time when I get my first job. Others will know what they're doing, and I'll be back at square one" (Iris, Interview, 5/14/97).

Does life along the seam of educational change necessitate the compromise of deeply-held professional and personal beliefs? What are the results of such schisms? To what extent, and under what conditions, can teachers remain functioning, developing, and effective professionals? How can we best prepare science teachers, especially new and prospective science teachers who have many immediate professional needs and concerns, to best deal with these conditions?

The Creation of More Supportive Contexts

Teachers' abilities to work and live along the seam of educational change, and to deal with the resultant professional and emotional tensions, may spell the difference between attrition and service, or between remaining a deeply committed professional who both grows and enjoys fulfillment as a teacher and one who slogs unthinkingly through the many daily trials of classroom life. Prospective teachers may not be fully prepared to deal with the demands of the change process, yet without their participation, reform efforts can not be maintained. As Reichert notes (1997, p. 93, my emphasis), science educators need to "prepare teachers for excellent practice in schools *as they are* and, at the same time. . .prepare them to engage in conversation and school practice as they believe *it ought to be* ." How can science teacher education programs respond to this challenge?

Many researchers have noted the extent to which uncritical and undersupported field experiences have been not only non-educative, but mis-educative (e.g., Britzman, 1991; Calderhead, 1988; Johnston, 1994). Sedlak (1987) noted that field experiences can emphasize imitation and subservience rather than investigation, reflection, and problem-solving.
In attempting to build more meaningful teacher education, the gestalt resulting from the mix of participants, settings, and programs must be kept in mind (Feiman-Nemser & Buchman, 1987; Zeichner, 1985). What is needed is a more systemic view of reform in teacher education, one which acknowledges the interaction of the people and complexities in classrooms, of the power dyanmics in educational hierarchies, of the assumptions about education held by society in general, and of the demands of teacher education.

"In our efforts to ascertain whether reforms were being implemented as intended, researchers and policymakers could have placed too much attention on the changes in the classroom without first looking to see whether conditions regarded as antecedent have been met" Tobin (1996, p. 175). Iris' story offers poignant testimony to the importance of this statement. If teacher education is to be founded on reform premises, attention must be given to creating the contexts and supports which will enable prospective teachers to deal with, even to thrive, in the messy borderland in which change takes place.

McIntyre, Byrd, and Foxx (1996) state that if teachers are to "view teaching as ongoing decision making rather than as a product or recipe. . .to manipulate objects to see what happens, to question what is already known, to compare their findings and assumptions with those of others, and to search for their own answers. . .constructivist teacher education must provide prospective teachers with the same orientation and experiences in both coursework and field experiences" (p. 172). The establishment of an atmosphere of experimentation, inquiry, and risk-taking would provide some of the necessary support for prospective science teachers struggling to find ways to enact reform ideals.

McIntyre, Byrd, and Foxx (1996) describe the merit of McCaleb, Borko, & Arends' idea of recreating field placements as "learning labs" which are open to risks and possibilities, rather than have them continue to be seen as "the real world" of limits and constraints. Such a rebuilt field experience would be "characterized by continuing inquiry by the student teacher, cooperating teacher, and pupils rather than by the transmission and incorporation of predetermined information" (McCaleb, Borko, & Arends in McIntyre, Byrd, & Foxx, 1996, p. 172). If science teacher educators truly believe that teachers of science should be reflective practitioners (Coble & Koballa, 1996), an inquiry orientation should pervade teacher education and define professional growth, even during the science teacher preparation program. Cochran-Smith (1991) states that reform-oriented prospective teachers benefit from placement with cooperating teachers who are experimenting with reform in their own classrooms.

As seen in Iris' case, however, the pairing of a prospective teacher who holds a reform-oriented philosophy with cooperating teachers who were either looking for an extra pair of hands and/or saw the university as an ivory tower did not create a harmonic context for a field experience. According to (Johnston, 1994), since field contexts supportive of reform ideals can not always be found, teacher educators must take more of a role in creating the conditions and relationships that would foster such contexts. It is important that teacher educators (a) attempt to find supportive

field contexts where the needs and assumptions of all involved parties more closely match, (b) work closely with both those parties over time in order to create a productive professional relationship that facilitates such an alignment, and (c) work even more closely and supportively with prospective teachers in those cases where a productive field context has not been able to be established. Also, if prospective teachers do not feel able to "take an active role in orchestrating...[or] processing" their field experiences, then teacher educators should take on the challenge of helping them to do so (Johnston, 1994, p. 206). This will require a deeper level of interaction than is commonly found in many field experiences: prospective teachers must be explicitly assisted in setting goals, inquiring into events, and reflecting meaningfully upon them, on a regular basis, with those involved in assisting his or her growth. Iris' most harmonic field context occurred during student teaching with a cooperating teacher who viewed their relationship as one of co-learners inquiring into teaching and learning: this is the one time that Iris identifies as offering real opportunities to learn to teach.

Hargreaves, Earl, and Ryan (1996) note that when teachers are asked to learn to teach differently from the ways in which they themselves were taught, it must be expected that "...teachers will wander and stumble, three steps forward and two steps back, as they try to assimilate and integrate these new ideas and turn them into manageable classroom practices." (p. 151). This stumbling, far from being envisioned by many prospective teachers as a productive, "problems are our friends" process (Fullan & Steigelbauer, 1991), is instead seen as a real and immediate threat to their ability to do well (or even to survive) in both their teacher education program and their chosen career. A clinical supervision (Acheson & Gall, 1997; Goldhammer, Anderson, & Krajewski, 1993) or cognitive coaching (Costa & Garmston, 1994) supervisory approach to fieldwork in schools, rather than the evaluative approach often taken, might offer prospective teachers the developmental help they need while empowering them as thoughtful professionals who have the ability to contribute to the resolution of the powerful educational dilemmas in which they find themselves. This might help to preclude a prospective teacher's retreat into political survival in the face of the dilemmas encountered during field experiences.

Cooperating teachers and university personnel must work closely together under the same assumptions and with the same goals if prospective teachers are to prosper and grow professionally. There have been extended calls for increased cohesion across the foundations, content, methods, and field courses in science teacher education programs (Anderson & Mitchener, 1994; Howey, 1996). Feiman-Nemser and Buchman (1987) state that schools must widen their understanding of the roles of teachers in this expanded context, and incorporate an appropriate reward system which enables continuous and multi-leveled teacher education. Coherence requires both appropriate preparation and appropriate support for the roles that cooperating teachers and university supervisors play. "Just as becoming a classroom teacher involves making a transition from being a student to being a professional, becoming a mentor involves making a transition from classroom teacher to teacher educator. . . [teachers] need time and commitment to develop the necessary understandings, skills, and orientations" (Feiman-Nemser & Buchman, 1987, p. 273). The same time and commitment must also be available for university supervisors, if they are to be expected to interact with prospective teachers in ways that help them feel valued and supported.

Collaborative teams consisting of prospective teacher, field supervisor, and cooperating teacher (similar to a PDS model) may be able to move prospective science teachers forward more productively from early in their field experiences. For example, a more involved and collaborative team might have been able to talk through and negate some of the politics, risk, and powerlessness that characterized Iris' understanding of field experiences. It might also have been able to help Iris avoid some of the isolation and disconnection that occurred as a result. As James (1996) exhorts, "People gain strength to act differently within their social worlds when drawing upon the help of others. . . Without such conditions, interrogating restrictive cultural ideologies may only arouse defensiveness and negativism" (p. 95). McIntyre, Byrd, and Foxx (1996, p. 179) agree, describing how prospective teachers who retreat into silence during problems may be blinded to "the need for reflection and growth and simply focus on survival and graduation." Certainly, these warnings echo Iris' actual experience.

Iris had been very committed to reform-oriented teaching, but she retreated into silence when she encountered the frustrations of change coupled with her anticipated powerlessness in the face of the politics of the learning to teach process. She had not been ready to construct reform-oriented teaching without seeing it modeled or supported in the field, nor did she expect to be placed in the position of justifying her right to attempt reform-oriented teaching. Teacher education in an age of reform should engage prospective teachers in dialogue about the myths and assumptions that permeate extant education and schooling, as well as the assumptions undergirding educational change efforts. Teacher education programs must do more to ready prospective teachers for the inevitable "bumps" along the reform road. They should assist prospective teachers in developing an understanding, not just of the rationale for change, but of the dynamics of the change process. Prospective teachers can be made aware of the problems they are likely to encounter, as well as possible ways to navigate those problems, as well as the places or people who can offer them support and help in doing so. Teacher education programs can help them to begin to enhance the mediation, leadership, and problem-solving skills that would enable prospective teachers to deal with change dynamics. Researchers like Hawkey (1996) and Kuzmic (1994) go further to posit that prospective teachers should "develop their 'organizational literacy', enabling them to not only settle into an organization, but also to understand the ways in which organizations can be influenced so that their own aspirations may be more fully realized" (Hawkey, 1996, p. 106). These paths are not likely to be easy to implement, yet they seem necessary if teacher educators acknowledge the needs, and the vulnerability, of those prospective teachers who are attempting the learning to teach process across the boundaries of reform.

Grimmett (in Wideen & Grimmett, 1995, p. 215) has noted that all people well-educated for the coming century will need to be "perceptive, critical, creative, and empowered learners who are capable of handling uncertainty and turbulence." The same, then, will have to be true of their teachers. Teacher education programs must therefore facilitate and support the events and processes that will help prospective teachers, especially reform-oriented prospective teachers, to develop in this way, rather than allowing them to take up mis-educative coping behaviors for the sake of political survival. The important lessons that science teacher educators can learn from Iris' story are: (a) that examining the beliefs and experiences of prospective teachers' learning to teach processes will allow teacher educators the ability to understand and guide the prospective teachers' development in deeper and more productive ways, (b) that the establishment an atmosphere of experimentation/inquiry and a more cohesive, collaborative approach to teacher education are needed, especially during field experiences, if teacher education programs are to foster the productive and educative experiences supportive of reform ideals, and (c) that the power dynamics inherent in the existing educational system must be explored and confronted if they are to be prevented from undermining reform efforts. As science teacher educators more fully explore prospective teachers' beliefs about teaching and learning, challenge the thinking and events that tend to reproduce the status quo, and look for the common points of departure that will help prospective teachers to construct an empowered and implementable new vision of themselves and their classrooms, science education reform will surely move closer to sustainability.

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Figure 1

Make an **X** representing your approximate placement on each continuum **at the beginning of your field experiences.**

Make a **slash /** representing your place you feel you **currently** occupy on each continuum now that you have ended student teaching.

Make a **circle O** representing your **eventual, desired place** on each continuum.

Treating all students similarly, responding to the needs of the group as a whole	Understanding and responding to individual students' interests, strengths, and experiences
Following the curriculum	Selecting and adapting curriculum
Focusing on the acquisition of information	Focusing on understanding/use of scientific knowledge, ideas, inquiry, and processes
Presenting scientific knowledge through lecture, text, and demonstration	Guiding students through active and extended scientific inquiry
Asking for recitation of acquired knowledge	Fostering scientific discussion and debate among students
Testing students for factual knowledge	Continued and varied assessment for informed instruction
Maintaining responsibility and authority	Sharing responsibility and authority with students
Supporting competition	Supporting classroom community (cooperation, shared responsibility, and respect)
Working alone	Working with other teachers

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